

Title Physiological aspects of diatomaceous-earth-treated cowpea weevil *Callosobruchus maculatus* (F.)
(Coleoptera: Bruchidae).

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Abstract

Investigations were carried out on the effects of a diatomaceous earth (DE) treatment on the physiology of the cowpea weevil *C. maculatus*. Adult female cowpea weevils were treated with DE at 25 deg C and 40, 75 or 99.9% relative humidity to determine the changes in body water content and cuticular water permeability. A twin differential microcalorimeter was used to determine the average energy production. Carbon dioxide release of single *C. maculatus* was recorded in a flow-through respirometer at 25 deg C. The highest body water loss rate occurred at 40% relative humidity. Even at 99.9% relative humidity, DE-treated insects continuously lost body water until they died after losing 46% of their body water. Microcalorimetric studies revealed that metabolic heat production rates in DE-treated cowpea weevils were significantly higher than in untreated insects. Predominately at 25 deg C ambient temperature, the DE-treated insects showed different respiratory patterns compared with untreated insects. The carbon dioxide release in untreated animals was more or less discontinuous, whereas in treated set ups, it occurred almost continuously. It is argued that the death of DE-treated cowpea weevils could be the result of high water loss together with stress-related high physiological metabolic activity.